

Nano-Engineered Materials for Rapid Rechargeable Space Rated Advanced Li-Ion Batteries, Phase I

Completed Technology Project (2007 - 2007)



Project Introduction

Lithium-ion (Li-ion) batteries are attractive candidates for use as power sources in aerospace applications because they have high specific energy, energy density and long cycle life. Yardney/Lithion Inc has become the leader in cutting edge Lithium Ion batteries. At the present moment, two of the Lithion batteries are operating on the surface of Mars with great success. In a conventional Li-ion battery when the rate is higher than C, their charge/discharge performance is severely degraded and loss its capacity permanently. Now we are focusing our interest to develop Li-ion batteries that can rapidly charge/discharge at high current rates. Yardney in collaboration with researchers at Worcester Polytechnic Institute, MA, proposes to investigate a new non-toxic nano-engineered electrode that significantly shortens the Li⁺ diffusion length within the electrode materials and increases the rate capability of Li-ion batteries. The goal of Phase I of this project will be to develop new nano-architected anode that has rapid Li⁺ recharge characteristics. Emphasis will be placed upon the construct of Fe₃O₄ based nano-engineered electrodes with Cu nanorods as current collectors. The high-rate capabilities change with the change in the diameter, packing density and aspect ratio of the Cu nanorods will be studied.

Anticipated Benefits

Potential NASA Commercial Applications: High power applications include power tools, electric vehicles and telecommunications. Automotive and industrial sectors, where the slim, small-sized battery will deliver large amounts of energy while requiring only a minute to recharge. For example, the battery's advantages in size, weight and safety highly suit it for a role as an alternative power source for hybrid electric vehicles.



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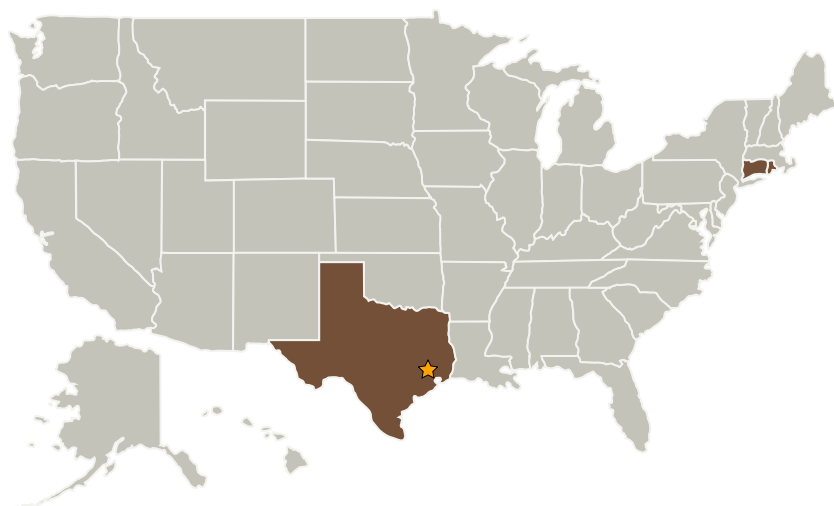
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Yardney Technical Products, Inc.	Supporting Organization	Industry	East Greenwich, Rhode Island

Primary U.S. Work Locations	
Connecticut	Rhode Island
Texas	

Project Transitions

January 2007: Project Start

July 2007: Closed out

Closeout Summary: Nano-Engineered Materials for Rapid Rechargeable Space Rated Advanced Li-Ion Batteries, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joseph S Gnanaraj

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - TX03.2 Energy Storage
 - TX03.2.1 Electrochemical: Batteries